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Research Article

Different Approaches To Studying The Natural-Scientific And Historical-Philosophical Heritage Of The Khorezm Academy Of Ma'mun

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Abstract: The article scientifically analyzes the rich natural science heritage and socio-philosophical views of the scientists of the Khorezm Academy of Ma'mun. The rich scientific research and socio-philosophical views of Abu Raikhan al-Biruni, Abu Nasr ibn Iraq and Abu Ali ibn Sina in the field of exact and philosophical sciences, characteristic of this period, are studied. based on exhaustive sources.

Keywords: exact and philosophical sciences, mathematics, astronomy, philosophical views, world, man, values, social relations, Renaissance, science, fundamental research.

1. Relevance of the topic

Eastern sources, including works written in the field of philosophical sciences in Khorezm in the X-XII centuries and which have come down to us, served as an important source, on the other hand, materials of archaeological research were used as material. Speaking about the origins of the development of philosophical sciences in Khorezm in the X-XII centuries, it should be noted that there is a tradition of continuity in science and the influence of ancient Greek science. The achievements of ancient Greek science were introduced in Khorezm in the X-XII centuries in two ways: the first - through direct translation and assimilation of the works of ancient Greek scientists from Greek into Arabic in Khorezm. For example, it is known that Abu Nasr Mansur ibn Iraq, the great scientist who lived and worked in Khorezm, the teacher of Abu Raikhan Beruni, translated the work of the ancient Greek scientist Menelaus «Spheric» from Greek into Arabic.

Secondly, the works of ancient Greek scientists were translated and developed into Arabic by the scientists who created them in Baghdad, the capital of the Arab Caliphate, and used by the scientists of the Khorezm Academy of Ma'mun. Due to this continuity, some scientific concepts in the works of Greek scientists, including in the field of philosophical sciences, also influenced the development of science in Khorezm in the X-XII centuries. Examples of this can be clearly seen in the work of Abu Raikhan Beruni. In their work «Geodesy» Greek scientists Eratosthenes, Hipparchus, Ptolemy (works «Geography» and «Almagest») provide information. It can be said that in the X-XII centuries in the scientific environment of Khorezm, the achievements of ancient Greek science were creatively used and developed with amendments and changes.

At the same time, the achievements of Indian science take place in the scientific potential of Khorezm. When Abu Raikhan Beruni wrote «India», he used and critically analyzed the achievements of the ancient Greeks and Indians in this area, including «Al-Arkand» and «Correction» of Brahmagupta and «Karana-tilaka» Vijayanand, which have not yet come down to us, astrology into the field of Muslim science through this work.

2. Main part

If we look at the development of science in Khorezm in the X-XII centuries in a broad sense, the scientific works created in the Arab Caliphate, especially in its capital Baghdad, are relevant from the point of view of continuity. Muhammad ibn Musa al-Khorezmi was the greatest scientist in the exact sciences of the Baghdad Academy. His works were effectively used by scientists who created Ma'mun in the Khorezm Academy. Abu Raikhan Beruni in his work «Geodesy» analyzed the studies of philosophers of the ninth century, such as Muhammad ibn Musa al-Khorezmi, Yahya ibn Mansur, Khalid ibn Abdulmalik, al-Makki, al-Fazari, that is, he got acquainted with their works and commented their works.

Studying the philosophical heritage of the scientists of the Khorezm Academy of Ma'mun, we first of all turned to the works of Abu Raikhan Beruni, preserved to our time and translated into Russian and Uzbek languages in various scientific publications in the form of tablets. It is known that Abu Raikhan al-Biruni wrote in 1036 a work called «The Catalog of the Books of Muhammad ibn Zakariya ar-Razi» and added a list of his works to it. In this list, he divided his work into 13 groups by topic, in total 113 names were mentioned in them. This list contains

eight topics related to specific sciences: spherical astronomy and zigzags (18 works); geodetic mathematics and geodesy (15); account (8); astrological catastrophe (4); astrolabe and working with it (5); synchronization problems (5); about meteors and comets (5); Astrology (7) [3]. Naturally, this list did not include the works written by the scientist-encyclopedia until the end of his life. Bulgakov made such a complete list and cited it as an appendix at the end of his monograph, and there are only 162 of them (the titles of the works are given in Arabic in the Russian translation and in the comments in the book) [1]. Unfortunately, only a few works from this list have survived.

Abu Raikhan Beruni in the work «Monuments of the Past Generation» broadly covers the chronology, ethnic status, culture, religious history of the peoples of the East. There is also information related to natural sciences. For example, the formation of thermal energy on Earth from sunlight, the state of water, and so on. In the chapter «Iranians in the Eid Months and Famous Days» of this major study, he mentions the days when «the moon meets and meets the sun,» including «On this day, the number of seas and water will decrease» [2, p. 420-424]. In modern astronomy, this process is called «the phenomenon of the rise and fall of sea water, which occurs under the influence of the gravity of the Moon and the Sun».

From the point of view of the exact sciences, the history of calendars is analyzed, and it is closely related to the problem of theoretical astrology, lunar and solar calculations, epoch-making history, calendar theories, positions of the moon, the theory of projections, etc. Information of Abu Raikhan Beruni about the peoples of Central Asia, including the Khorezm and Sogdian calendars, leap years and Khorezm views of the catastrophe, based directly on local sources. For example:

- Day and night, they talk about the essence of the set and the beginning (time) of the two.
- The essence of months and years, consisting of day and night.
- About the Jewish years and other periods, beginnings, moods and leaps of years and months.
- About the famous days of the Khorezm months.
- About the position of the moon, its rising, setting and shape, etc.

From the point of view of the history of mathematical science, what is written in Osar al-Bakiya about hand projections is important, and we can say that the cylindrical projection was discovered by Abu Raikhan Beruni in this work.

Osar al-Bakiya Abu Raikhan al-Biruni contains many tables of various kingdoms and dynasties that ruled in different periods, including the Macedonian Batlim (Ptolemy), Romans, Christians, ancient Iranians, Sassanid dynasties and Arab caliphs (Umayyads and Abbasids).) How. They are taken from sources so reliable that the periods of kingship are presented almost correctly, and they are fully confirmed by comparison with other historical books.

On some issues, he disagrees with the views of previous scientists. For example: 1) Is the speed of the Sun a constant value of the zodiac? While Ptolemy replied in the affirmative, Abu Raikhan Beruni replied in the negative. This also raises the question of whether the ecliptic rotates. This problem, in turn, created a difference between the ideas of Kepler and Copernicus; 2) Is it possible to determine the year by the motion of the moon and, therefore, by the lunar unit? Abu Raikhan Beruni disagrees with Hipparchus and Ptolemy; 3) Abu Raikhan al-Biruni reveals that Abu al-Faraj's story about the fire that broke out in Kalwa was fiction. 4) Hamza ibn Hasan says that Muhammad ibn Musa ibn Shakir's description of Navruz is incorrect. But Abu Raikhan Beruni justifies Muhammad ibn Musa al-Khwarizmi.

He explores scientific discussions between other scientists who have lived in different centuries. Among them are the disagreements between Thabit ibn Kurra and Jolinus, ar-Razi and Tammar. Abu Ali ibn Sina objected to some of the ideas from the Book of Anwa.

One of his questions to Ibn Sina, the question of violence, is also mentioned in Asar al-Bakiya.

He also gives accurate calculations of the length of the solar year in his Monuments of Past Generations. Provides information on its status and day-to-day equivalence. Then he dwells on the problem of the apogee of the Sun and explains it. He criticizes them, pointing out the mistakes of his predecessors in determining the length of the solar year.

The analogy method is widely used in Abu Raikhan Beruni. The analogy is used to refute the concept of a past life and body. Such data are found at different times. Those who have not seen him know this far from crazy. Abu Raikhan Beruni pays special attention to the method of comparison in cognition [1].

In this work, Abu Raikhan Beruni pays great attention to the calendar - the system of day and night. In hi

story, every nation generally had its own calendar. The principles of their differences include the reason for onset, the number of days in the month, and the variety of methods used. History shows that there are inaccuracies in the calculations. The well-known ancient calendar system of Khorezm existed 980 years before the invasion of Isnadar Zurkarnayn. So, the history of Khorezm 3300 years ago is known [1, pp. 29].

As noted in the encyclopedic work, the Khorezmians used the positions of the moon. They made judgments about the disaster. We remembered the names of the addresses. Later, those who knew in what mood they were watching disappeared, says Abu Raikhan Beruni [1, p.30]. The Khorezmians divided the position of the moon into 12 constellations and named them in their languages. Abu Raikhan Beruni gives the names of the signs of the zodiac (zodiac) - in addition to Khorezm, Arabic, Persian, Syrian, Hebrew, Hindi.

The calendar problem that Abu Raikhan Beruni was dealing with has not yet been properly resolved. The issue of switching to a new calendar since 1834 was raised several times. The UN Economic and Social Council also dealt with the calendar issue in 1954.

A number of issues outlined in the encyclopedic book «Monuments of Past Generations» are important for illuminating the history of science.

His seven treatises on India are mentioned in his book India, and it is estimated that there are even more [2]. Some of them are devoted to the exact sciences. In terms of content, they covered topics such as the Indian system of calculations, Indian perceptions of solar and lunar eclipses, the position of the moon, fixed stars, and concepts of astrology.

The greatest work of an encyclopedic scientist on the history of India, also contains information on specific sciences. The main focus is on the analysis of books on disasters in India:

Chapter 14 deals with Surya-siddhanta, Vasishtha-siddhanta, Romaka-siddhanta, Pulisa-siddhanta, Brahma-siddhanta, chapter 15 on the system of units of measurement among the Indians, chapter 16 on the system of units of measurement in India. the account with the Indians. Chapter 18 is a geographic description of India, distance, Chapter 19 is a measure of catastrophe and time in India, chapters 20 and 21 are catastrophic geographic problems in India, chapters 32-45 are a timeline in India, chapters 45-48 are chronology in chapters 49-53, chapters 54-55 are devoted to astronomy, chapter 56 discusses the position of the moon, chapter 57 is devoted to the time of rising of the stars, chapter 59 is devoted to astronomy, chapter 60 is devoted to lunar eclipses.

In 1926, V.V.Bartold studied a unique copy of Istanbul, from which fragments of the history of Khorezm were copied, and in 1941 they were translated into Russian by S.L. Volin and published [3, pp.161-163].

The first scientific study of the exact sciences from this work was published in Calcutta in 1951 and was devoted to the history of measuring the length of the earth's meridian [3, p. 163]. The scientific-critical text of the work was prepared and published in 1962, first in Ankara by al-Tanji, and then in the same year in Cairo by P.G.Bulgakov [3, p.164]. P.G.Bulgakov translated the work into Russian and published it in Tashkent in 1966, together with an introductory speech and scientific commentary, which consisted of extensive research [4].

In the work «Geodesy» by Abu Raikhan Beruni, this is a large introduction, consisting of five chapters, entirely devoted to the problems of geodesy, that is, a major work in the field of philosophical sciences. It includes mathematical methods for determining latitude based on the heights of stars and the height of the Sun, measuring the angle of inclination of the ecliptic, determining the maximum deviation, and studying the study of these issues in the history of science. advanced scientific issues of their time, such as measuring the distances between settlements based on their geographical coordinates, determining the direction of the qibla. Both practical and theoretical aspects of the problem are covered. Scientific conclusions in «Geodesy» are directly based on the observations of Abu Raikhan Beruni himself, the results of calculations, that is, geodetic and astronomical observations. In this play, Abu Raikhan Beruni separated geodesy from astronomy and turned it into a separate science.

Abu Raikhan al-Biruni's treatise «Tamhid al-mustakarr li tahqik mana al-mamarr» (Preparing a reasonable basis for defining the concept of transition [lamps]).

The brochure is devoted to the problem of astronomy, in which light passes through certain points on the celestial sphere. At the same time, he was also interpreted from an astrological point of view. The brochure lists the names of well-known and little-known scientists who widely use the written heritage of ancient Greek, Indian, Middle Eastern and Middle Eastern sciences [5, p. 58-63].

The full title of the brochure «Cartography» is «A book about the depiction of constellations on a flat surface and the depiction of countries on a flat surface» («Risala fi tastih al-suvar and tabtih al-quvar»). It is described in an article by A.Akhmedov in collaboration with B.A. Rosenfeld and noted that this is one of the first works written by the scientist. A Russian translation of the brochure is also available in a single copy in the Leiden University Library [6, pp. 127-153]. This is described in the monograph by P. G. Bulgakov. In the list of works of the encyclopedist, it is called «Istiyab fi tastih al-kura» - «The final (collection) on flattening the sphere» [3, p. 309].

Earlier this work was translated into Uzbek and published by A. Rasulov [7, pp. 244-259].

Some of the works written in the field of philosophical sciences in Khorezm in the X-XII centuries belong to Abu Ali ibn Sino. Although Ibn Sina was mainly known in the field of medicine, he was also a scientist who worked in the field of exact sciences. For example, in his Arabic works «Kitab ash-shifo» and «Kitab an-najot» and in the Persian «Donishnoma», issues related to mathematics and physics were separately considered.

3. Result

In general, there are many works of Ibn Sina, and it is known that their list was compiled by Abu Ubayd Abdulwahid al-Juzjani, a student of the scientist. The manuscript contains a list of 318,148 works of Ibn Sina stored in the treasury of the Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan named after Abu Raikhan Beruni, K. Brokelman 250 [11], J. Sh. Kanavati in his catalog. 276, Iranian scientist Said Nasafi 456 (of which 242 survived), who named the work [9, pp. 3-4]. Ibn Sina's works contain scientific ideas in a number of areas of exact sciences - classification of exact sciences, mathematics, astronomy, physics, mechanics, optics, and music theory.

When writing this article, we used the works of scientists who contributed to the development of philosophical sciences and the study of social relations in Khorezm in the X-XII centuries - Ibn Iraq, Abu Raikhan Beruni, Ibn Sino and others. It should be noted that their works on philosophical sciences or parts (chapters) of major works have been translated into Russian and published, and we referred to these translations in the course of our research in the article.

A special article was published by G.P.Matvievskaya in the study of translations of specific scientific information in the writings of Ibn Sina and research devoted to them [12, pp. 16-40].

Ibn Sina's treatise, The Encyclopedia of Enlightenment (also known as The Book of Scarlet, The Wisdom of Scarlet), was written in honor of Alouddawla Abu Jafar Muhammad Ibn Dushmanzar (398 / 1007-483 / 1041). The reason is that Ibn Sina lived in his palace for some time.

The encyclopedia includes five brochures, each of which is devoted to a particular area of science at the time: logic, physics, science, music, the supernatural or metaphysics.

This work also contained mathematical knowledge; they were originally lost and restored by his disciple after the death of Ibn Sina [9, pp. 30-31]. Thus, it can be said that this treatise contains Ibn Sina's scientific views on astronomy and mathematics.

It is known that Ibn Sina's Danishnoma was translated into Russian [14], and in the West into French [15]. On this basis, some other parts were translated into Russian and published, including parts on mathematics by B.A. Rosenfeld and N.A. Sadovsky (1967) [16].

The questions of Abu Raikhan Beruni to Ibn Sina (18 in total) and their answers have come down to us in the form of a separate treatise. The fact that they discuss specific sciences, including astronomy, is directly related to the topic of our dissertation research. Ten questions are asked from the face of Aristotle's Heavenly Book (celestial sphere, movement of celestial spheres, dimensions of a flat face, etc.) [9, pp. 38-39]. Ibn Sina develops Aristotle's views on the concept of infinity.

Correspondence in science is called «Answers to ten questions asked by sheikhurrais (Ibn Sina)» («Ajuba an ashara masail sa'ala anho ash-sheikh ar-rais») 328. This treatise also occurs under other names: «Letter to Abu Raikhan Muhammad ibn Ahmad al-Abu Raikhan Beruni» («Risala and Abu Raikhan Muhammad ibn Ahmad al-Abu Raikhan Beruni») [13]. The next eight questions refer to some questions from Aristotle's book Physics. At present, the correspondence has been translated into Russian by Yu.N. Zavadovsky and published (1957; reprinted in 1973) [19, p. 19].

Ibn Sina's treatise The Essence of Letters (Sharh Huruf at-Tahji) deals in part with practical astrology and discusses the nature of each letter in the Arabic alphabet [20].

In the theoretical part of Ibn Sina's treatise on the classification of philosophical sciences (Risala fi aqsam al-hikma), the lower, middle and upper classes are considered, and the middle class is defined as the sphere of mathematical knowledge.

The book of healing is Ibn Sina's encyclopedic work, a collection of scientific and philosophical knowledge: it consists of four parts (sentences) and 18 volumes. The first is logic (al-ilm al-logic), the second is physics (al-ilm at-natural), the third is mathematical sciences (al-ulum ar-Mathematical), and the fourth is metaphysics (al-ulum al -olihiyya). includes therefore, in this part, the mathematical sciences are highlighted.

There are a number of restrictions on studying the Book of Healing in science. For example, F.Wöpke (1863), K.Lokoch (1912), H.Mukhammadiev, M.S.Sharipova [23, pp. 7-29; 24, pp. 3-30], G.Jalolov [25, pp. 122-134], G.Masharipova [26. Pp. 41-49] and others.

Another work, Risala fi tahqik az-zawiyya (Treatise on the determination of angles), also belongs to Ibn Sina and to a certain extent is also related to mathematics and deals with acute angles.

The treatise «Risola fi tahkik az-zoviyya» («On the determination of the angle») was translated into Russian by AT Grigoryan and MM Rozhanskaya (1974) [27].

One of the scholars of the Khorezm Academy of Ma'mun is Abu Nasr ibn Iraq. It is believed that he was born between 961-965 and died between 1034-1036; G.P.Matviyevskaya and H. Tllashev are co-authors of an article entitled "Scientific Heritage of Ibn Iraq" [28, pp. 219-234]. His full name is given in the form of Abu Nasr Mansur ibn Ali ibn Iraq, which indicates that he belongs to the dynasty of Iraqis belonging to this dynasty. Khorezmshahs. Ibn Iraq lived first in Kat, then in Gurganj, the capital of the Khorezmshahs, and Mahmud Ghaznavi conquered Khorezm in 1017 and brought scholars to Ghaznu. He was the teacher of Abu Raikhan Beruni and worked with him for many years.

The above article shows that there are 25 works of Ibn Iraq, most of which have come down to us, some of which are known from other works, and a list of these works is provided. This list lists all of his works on astronomy and mathematics separately, with a short reference and a study of the date of their writing, whether they survived or not, and which of the Orientalists will be mentioned in his work. Some of the treatises written by Ibn Iraq were published as a separate collection in 1943-1947 in Hyderabad, India.

In his book on the history of trigonometry, G.P. Matvievskaya summarizes the work of Ibn Iraq in astronomy and mathematics [29, pp. 106-110].

Al-Majisti al-Shahi (Royal Almagest) is a major work of Ibn Iraq. It has not reached us, and some excerpts from it can be found in the treatises of Abu Raikhan Beruni and Nasriddin Tusi [29, p. 108].

It is known that Ibn Iraq wrote commentaries on the writings of a number of scholars who lived before him. For example, «Treatise on the proof of Abyssinian calculations using correction tables» or «Table of minutes» («Risola fi table ad-daqoiq»); in it, in particular, about trigonometric functions used in solving spherical astronomical problems. K. Jensen studied this work (1971) and came to the conclusion that the method of calculation in it corresponds to Greek science, more precisely to the time of Claudius Ptolemy [30, p. 1-19].

In his treatise on the proofs of the calculations of Muhammad ibn as-Sabah, Ibn Iraq, in turn, points out the mistakes made by al-Sabah in the matter of the deviation of the ecliptic relative to the celestial equator [29, p.109].

Ibn Iraq also has works related to the manufacture of the astrolabe. The article by H.Tllashev and S.Ramazonova notes that four treatises of the scientist are devoted to the instrument of astrology, the astrolabe, and some examples are given:
1) «Treatise on the astrolabe» («Risola al-asturlab»); 2) «Treatise on the dispute between Abu Hamid al-Sagani and the ray astronomer in the field of working with the astrolabe» 3) Treatise on the transitions of azimuthal circles

(search points) in the astrolabe (plane); 4) «Treatise on the preparation of asturloba using the practical method» («Risola fi san'at al-asturlob bi-t-tarik al-sanai») [31, pp. 89-97].

His work in mathematics is more about spherical astronomy, more precisely trigonometry. In particular, the Greek scientist Menelaus interpreted Spherica in a trigonometric manner. The text of the work was translated into German by M. Krause in 1936 on the basis of a single copy stored in the library of Leiden University and published with a detailed description. philological office [32, p.219].

This work consists of three chapters dealing with spherical triangles, the position of parallel circles on the surface of a sphere, and lemmas on basic relations [28, p. 223-230].

Risala fi-l-cavab masail al-handasa Ibn Iraqah (Answering questions about Handasa) and The theorem of sines on planar and spherical faces and their application in right-angled and curved triangles, Risala fi tastix, Two of Abu Ja'far al-Khazin min as-sahw fi zij as-safaih (the treatise of Abu Jafar al-Khazin on correcting what he did not pay attention to in his Zij) was studied by G. Zuther and MTT Debarno [29, p. 111].

Abu Abdullah Muhammad ibn Ahmad ibn Yusuf al-Khorezmi (d. 997) was born and raised in Khorezm, was educated (mainly in Kat), then lived in various cities of the Samanid state (Nishapur, Bukhara). secretary in Utbi service 346. His knowledge of the classification of sciences was formed under the influence of ancient Greek scholars, as well as the works of al-Kindi, Abu Nasr al-Farabi, Abu Bakr al-Razi, and later he became a major encyclopedist in this field [34, p. 144]. The main work in the field of classification of sciences «Mafatih al-Ulum» («Key to knowledge») is an encyclopedia that provides information about the science and culture of the Muslim East of its time and covers almost all areas of that period: jurisprudence, philosophy, logic, poetry, arithmetic, handasa , chemistry, etc., in total - 93 chapters. Abu Abdullah traditionally divides sciences into two groups: Sharia science and non-Sharia science.

The work is divided into two parts, which, in turn, comprise a total of fifteen chapters.

The first part includes fiqh, kalam, grammar, stationery, theory of poetry, history; The second part provides information on philosophy, logic, medicine, arithmetic, handasa, astronomy, music, mechanics and chemistry.

On specific sciences in the work of G.P. Matvievskaya [36, 88-96], B.A.Rozenfeld [38], M.M. Rozhanskaya [39], H. Hasanov [40]. In his research, R.M.Bakhodirov focused on the areas of calculation, handasa, astronomy, music, mechanics [34, pp. 94-98].

The exact sciences part of Mafatih al-Ulum by Abu Abdullah al-Khwarizmi focuses on theoretical calculations and occupies four of the five chapters on accounting in this work; the fifth chapter is devoted to practical accounting. The account data was examined by G.P.Matvievskaya [37, p. 341]. I.Kh.Ibodov translated chapters on specific sciences with commentaries from Arabic into Russian [41, p.54].

In Mafatih al-Ulum, the section on Khandas is divided into four chapters: the first chapter is devoted to the theoretical part, the second chapter is devoted to lines, the third chapter is devoted to the flat forms of handwriting, and the fourth chapter is devoted to the handwritten forms of objects. (cubes, cones, balls).

The astronomical part of the treatise consists of four chapters: 1) the arrangement of inseparable and fixed stars in the constellations; 2) the state of lights in the sphere of the Universe, the surface of the Earth and its climates and other mathematical geographical elements; 3) the basics of astrology; 4) Emergency tools.

4. Method

Manuscripts on specific sciences, stored in the treasury of the Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan named after Abu Raikhan Beruni, also served as an important source when writing the article. Manuscripts on specific sciences are included in the eleven-volume catalogs of manuscripts of the Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan named after Abu Raikhan Beruni for [42] and the Catalog of Oriental Manuscripts of the Academy of Sciences of the Republic of Uzbekistan. The Republic of Uzbekistan. Exact and natural sciences ”is presented in a separate book [43] in Russian (1998). We used these publications: in the collection of philosophical and natural sciences, oriental manuscripts in Arabic, Persian and Turkic languages are described in the order of disciplines. It is also divided into the fields of arithmetic, algebra, handases, astronomy and astrology, astronomical instruments, calendars, geography: encyclopedias are also separated, which, in addition to the exact sciences, also contain chapters on philosophy [56].

Of the areas listed above, only a few are relevant to our research. These are Abu Raikhan al-Biruni At-Tafhim [44], Ibn Sina Qunuz al-Ma'rifa [45] and Ganj al-Ma'ruf [46], Correspondence of Abu Raikhan Beruni and Ibn Sina [47] and Mahmud Chagmini «Al-Mulahhas fil Khaya [48] and Persian» ... commentaries to it by Ali al-Jurjani [49], Qazizada Rumi [50] in Arabic and Hussein al-Kubrawi in Persian [51].

The aforementioned collections also describe the manuscript of a treatise on astrology and astrology by the Central Asian scholar Abu Nasr al-Farabi entitled «A Treatise on Reliable and Unreliable in Judging Stars» [52]. The play tells about the corresponding, but rather difficult to understand, phenomena associated with the position of the stars celestial bodies and their relationships.

Most of the works on specific sciences described in the collection refer to places outside Central Asia, as well as many works whose authors are not mentioned, and something can be said about the author only if they have been specially studied.

The scientist Chalabi, originally named Mustafa ibn Abdullah (1017/1609-1065/ 1657), known in science as a Turkish geographer and historian, published more than 20 works, including «Jahonnoma» («World Mirror») - historical and geographical and Kashf Az-Zunun is the author of well-known bibliographic brochures [55].

The article uses the bibliographic work of Haji Khalifa.

The entire work is called «Kashf az-zunun an asomi al-qutub wa-l-funun» («Elimination of doubts about the names of books and sciences»). Consists of an introduction, general information about science, bibliography, conclusion. The main part - bibliography contains information on 15,000 works, 10,000 authors and more than 300 disciplines.

«Kashf az-Zunun» was published by G. Flugel in 1835-1858. In seven volumes with Arabic text and Latin translation366 and subsequently became the main book for many in science; In subsequent years, the work was published several times in Turkey and Lebanon [54].

The names of many Khorezm scholars are mentioned in the work of Haji Khalifa «Kashf az-zunun». In particular, it provides bibliographic information about the scientists of the Khorezm Academy of Ma'mun, who worked in the field of exact sciences, and their scientific heritage. For example, Muhammad ibn Musa al-Khwarizmi, Abu Raikhan al-Biruni, Abu Ali ibn Sina, Abu Ali al-Hasan ibn Harit al-Khwarizmi al-Khububi and others.

One of our renowned scholars is Abu Abdullah al-Khwarizmi. In the literature, the full name of the scientist is recorded as Abu Abdullah Muhammad ibn Ahmad Yusuf Katib al-Khorezmi. He lived and worked in the 10th century, studying mathematics, astronomy and geography.

According to sources, he worked in Nishapur from 975 to 1991 and was secretary to Minister al-Utbi. He wrote Mafatih al-Ulum (Keys of Knowledge). Four of his manuscripts are [58, p. 80]. Three of them are kept in the British Museum under numbers 7528, 23429 and 2524, and the fourth in the Berlin Library under number 1051. The British scientist C. Bosworth discovered in the 1960s that six more copies of this work are in Turkish libraries. They are kept in the libraries of Istanbul.

This work of Abu Abdullah al-Khwarizmi attracted the attention of many scientists as a rare source on the history of the development of science in the Middle Ages. The Dutch orientalist Van Floten was the first to study this source, published in 1895. Also studied were V. Bartold, K. Brokkelman, I. Krachkovsky, E. Videman, G. Sarton, M. Khairullaev, Y. Karimov, G. Matvievskaya, H. Hasanov, A. Sharipov, R. Bakhodirov and Y. Ibodov. various aspects of work.

bu Abdullah classifies sciences as follows:

I. Sharia sciences and related «Arabs» [59, p. 24].

1. Fiqh, that is, Muslim jurisprudence.
2. Word, that is, the foundations of religion.
3. Grammar.
4. Record keeping.
5. Poetry vaaruz.
6. History.

II. «Non-Arab» sciences (Greeks and other peoples).

1. Theoretical philosophy:

a) natural sciences - medicine, celestial phenomena - meteorology, mineralogy, alchemy, mechanics - science, music;

c) divine, that is, metaphysics;

d) logic.

2. Applied philosophy:
a) ethics (management of people);
b) housekeeping (house management);
c) politics (urban, rural management).

The book of Mafatih al-Ulum consists of two parts, the first part consists of 5 chapters and the second part consists of 9 chapters.

The first part consists of the following sections:
Grammar, the art of speech, the art of writing, poetry and writing poetry, stories.
The second section includes the following sections:
Philosophy, logic, medicine, arithmetic, geometry, astronomy, music, mechanics, chemistry.

Abu Abdullah Khorezmi examines it in five sections of the accounting section of the work. He writes that arithmetic is the science of numbers. It is divisible into even and odd numbers. Odd numbers are such that they are not divisible into two equal parts, but even numbers are divided into two equal parts. If an even number is added to an even number, the result is again divisible by two until the division becomes one.

The second part of the book is of interest to naturalists and mathematicians in the book of Abu Abdullah al-Khwarizmi «Mafatih al-Ulum» [60, p. 54]. Chapter 8 is devoted to mechanics, in which the movements of solid, liquid and gaseous bodies and their weights are studied by ancient Eastern scholars.

The geometry section of the work deals with problems about conditions, lines, surfaces, objects. Abu Abdullah al-Khwarizmi writes: «The ancient Greeks called this art Geometry, which means 'measuring the earth». He says that the word «geometry» is an Arabic word. In Persian, this word is called pattern or size. Then, the writing of the «Foundations» of Euclid by secretary al-Khwarizmi, disseminating them in the East among Muslims in general, provides evidence for the interpretation of Euclidean geometry by some scholars.

Abu Abdullah al-Khwarizmi divides nine types of bodies:

1. Tetrahedron. It is bounded by a regular quadrilateral or four equilateral triangles. It has four sides, four three and six sides.
2. The cube is limited to six squares with equal sides and corners. It has six sides, twelve sides, and eight triplets.
3. Octahedron is a regular octagon. It is bounded by eight equilateral and equilateral triangles. The octahedron has eight sides, six three and twelve edges.
4. The icosahedron is bounded by twenty equilateral and equilateral triangles. It has twenty sides, twelve, thirteen and thirty sides.
5. Dodecahedron - bounded by twelve regular pentagons with equal sides. It has twelve sides, twenty-three and thirty sides.
6. A body that starts with a cylindrical circle and ends with the same circle. It is limited by the surface.
7. A cone is a body that starts at a point and ends in a circle. It is bounded by a circle at the bottom and then by a conical surface.
8. A sphere is a body that is equidistant from one point at all points on its surface. It is called the center of the sphere. Any straight line from the center of a sphere to its surface is its radius. The line passing through its center and connecting two poles is called the axis of the sphere.
9. Body bounded by a circular surface. In addition, there are sickles and turnips.

5. Conclusion

From the analysis of these sources, the following conclusions can be drawn:

1. In Khorezm in the X-XII centuries, from the point of view of that time, great scientific research was carried out in the field of exact and natural sciences. Evidence of scientific achievements of that period can be found in scientific works written in the kingdoms of Ma'mun-Khorezmshahs and Anushtegini-Khorezmshahs.
2. In Khorezm in the X-XII centuries there was an increase in interest in the exact and philosophical sciences, and this was primarily due to everyday practical needs, i.e. research in this area was associated with the development of irrigated agriculture in Khorezm, the expansion of trade. relationships, cultural and spiritual life. Also, catastrophic observations were directly related to practical necessity and were considered necessary for the correct organization of agricultural work in ancient Khorezm, for determining the water content of the Amu Darya, and its rational use.
3. Scientists made conclusions about the achievements in the field of natural and exact sciences on the basis of the monuments of their time, that is, the written heritage. This was done by publishing critical texts of

existing sources, translating them into other languages and publishing them in whole or in part in the form of tablets with scientific comments. In particular, the works of Abu Raikhan Beruni, Ibn Sino, Ibn Iraq, Mahmud Chagmini, who wrote in the X-XII centuries in Khorezm and wrote works in various fields of science.

4. With the publication of primary sources, wider opportunities have opened up for scientific research, including in the field of studying the history of natural and philosophical sciences.

5. An analysis of the sources on the topic of the dissertation shows that only some of them are currently in scientific circulation and there is still a lot of work to be done in this direction in the future.

6. Among studies devoted to the natural and philosophical sciences, the analysis of the scientific problems mentioned in them is more important than the translation of sources.

7. The achievements of ancient Greek science were introduced in Khorezm in the X-XII centuries in two ways: the first - by direct translation and assimilation of the works of ancient Greek scientists from Greek into Arabic in Khorezm. It is known that Abu Nasr Mansur ibn Iraq translated from Greek into Arabic the work of the ancient Greek scholar Menelaus «Spheric». Secondly, the works of ancient Greek scientists were translated and developed into Arabic by the scientists who created them in Baghdad, the capital of the Arab Caliphate, and used by the scientists of the Khorezm Academy of Ma'mun. This is clearly seen in the work of Abu Raikhan Beruni. In their work «Geodesy» Greek scientists Eratosthenes, Hipparchus, Ptolemy (works «Geography» and «Almagest») provide information. It can be said that in the X-XII centuries in the scientific environment of Khorezm, the achievements of ancient Greek science were creatively used and developed with amendments and changes.

8. Collection of scientific and philosophical knowledge in the encyclopedia «Kitab al-Shifa» Abu Ali ibn Sina: it consists of four parts - the first is logic (al-ilm al-logic), the second is physics (al-ilm. At-natural) , third - mathematical sciences (al-ulum ar-Mathematical), fourth - details of metaphysics (al-ulum al-alihiyya), information about which is of great importance today.

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